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ABSTRACT

A truss building system is described in which a plurality of elongate aluminium truss units (10) may be joined end to end by a cluster post (12). The cluster post (12) is formed with
5 four slots (14) and a central hollow shaft (16). Each slot (14) is defined by a pair of side walls (18), there being eight side walls altogether defining the four slots (14). A first pair of slots (14) face in opposite directions to each other and define a first joining plane, and second pair of slots (14) face in opposite directions to each other and define a second joining plane perpendicular to the first joining plane. Each of the slots (14) is sized to
10 receive an end of one of the truss units (10) therein, and a series of eight lock pin holes (20) are grouped at each end through the side walls (18). The truss units (10) are locked to the cluster poster (12) by means of two lock pins (22) received in the lock pin holes (20). One of the principal advantages of the truss building system is that the cluster posts allow
15 the trusses to span in both longitudinal and transverse directions. This means that the system can be supported from a variety of anchor points in either direction, and it also allows for a more uniform distribution of load.

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**COMPLETE SPECIFICATION FOR A
STANDARD PATENT**

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Standard Complete Specification for the invention entitled:

A TRUSS BUILDING SYSTEM

Details of Associated Provisional Applications:

PQ7167 filed 28 April 2000

The following is a full description of this invention, including the best method of performing it known to me:-

A TRUSS BUILDING SYSTEM

FIELD OF THE INVENTION

5 The present invention relates to a truss building system and relates particularly, though not exclusively, to a building system that employs aluminium trusses that can be joined together in both longitudinal and transverse directions.

BACKGROUND TO THE INVENTION

10 In large building construction projects it is known to use trusses to build scaffolding covering spans where conventional tube and coupler scaffolding is insufficiently strong or otherwise not suitable. Such trusses are typically made from steel in the form of "unit trusses" or "lattice beams". These steel trusses are formed with a fish plate at each end having six holes provided therein to permit the trusses to be joined end to end with six bolts. The steel trusses are heavy and time-consuming to handle. Furthermore, in order to build a matrix or grid using such prior art steel trusses, they must be laced together using tube and coupler scaffolding.

15
20 The present invention was developed with a view to providing a truss building system that facilitates rapid construction of scaffolding with or without conventional tube and coupler scaffolding. However, it will be apparent that the truss building system according to the invention is not limited in its application to scaffolding, but can be used for constructing many other types of building structures.

25 **SUMMARY OF THE INVENTION**

Throughout this specification the term "comprising" is used inclusively, in the sense that there may be other features and/or steps included in the invention not expressly defined or comprehended in the features or steps subsequently defined or described. What such other features and/or steps may include will be apparent from the specification read as a whole.

According to one aspect of the present invention there is provided a truss building system, the system comprising:

30 35 a plurality of elongate truss units;

a cluster post formed with four slots, each of said slots being adapted to receive an end of one of said truss units therein, a first pair of said slots facing in opposite directions to each other and defining a first joining plane, and a second pair of said slots facing in opposite directions to each other and defining a second joining plane, said first and second joining planes being arranged at a predetermined angle to each other; and wherein fastening means are provided for fastening the end of a truss unit in each of said slots whereby, in use, two of said truss units can be joined end to end along the first of said joining planes and two more of said truss units can be joined end to end along the second of said joining planes.

According to another aspect of the present invention there is provided a cluster post for a truss building system, the cluster post comprising:

- 15 a rigid member formed with four slots, each adapted to receive an end of a truss unit therein, a first pair of said slots facing in substantially opposite directions to each other and defining a first joining plane, and a second pair of said slots facing in substantially opposite directions to each other and defining a second joining plane, said first and second joining planes being arranged at a predetermined angle to each other; and
- 20 a fastening means for fastening the end of a truss unit in each of said slots whereby, in use, two of said truss units can be joined end to end along one of said joining planes and two more of said truss units can be joined end to end along the other of said joining planes.
- 25 Advantageously said first joining plane is substantially perpendicular to said second joining plane whereby, in use, said truss unit can be joined to the one cluster post in both longitudinal and transverse directions. Preferably each slot is defined by a pair of side walls, there being eight side walls altogether defining the four slots. Preferably said fastening means comprises a plurality of holes formed in each pair of said side walls adapted to align with corresponding holes formed in the ends of the truss units, and wherein a locking pin is provided adapted to pass through said holes when aligned and to lock the end of the truss unit in the slot.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to facilitate a more comprehensive understanding of the nature of the invention, a preferred embodiment of the truss building system in accordance with the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

5 Figure 1 is a perspective view of a preferred embodiment of a cluster post joining three trusses in accordance with the present invention;

10 Figures 2(a), (b), (c), (d), (e) and (f) illustrates the main components of the preferred embodiment of the truss building system in accordance with the present invention;

15 Figure 3(a), (b) and (c) illustrate a typical application of the truss building system of Figures 1 and 2 used to form a simple span;

20 Figure 4 illustrates the truss building system used to form a simple building frame;

25 Figure 5 illustrates the truss building system used to form a catch fan;

30 Figure 6 illustrates the truss building system used as scaffolding under a floor;

35 Figure 7 illustrates the truss building system used to form a support frame for hanging lights and audio equipment in theatres and auditoriums;

40 Figure 8 illustrates the truss building system used to form a dome building; and

45 Figures 9 and 10 illustrate the truss building system used to form a stage.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

30 Figures 1 and 2 illustrate the main components and basic principle of a preferred embodiment of the truss building system in accordance with the present invention. The system comprises a plurality of elongate aluminium truss units 10, which are typically made in one metre, two metre and three metre lengths. Each truss unit 10 is of standard configuration and comprises a top chord (compression) and a bottom chord (extension)

35 made from 48.40mm diameter aluminium tubing, and joined at each end by a transverse

length of the same aluminium tubing. A series of diagonal aluminium struts made from 33mm square hollow section, give the truss its strength and rigidity. A transverse hole is provided adjacent the ends of each of the top and bottom chords on each truss for joining purposes.

5

A key component of the FlexitruSS building system is a cluster post 12 which acts as a node piece at which the truss units are joined end to end. The cluster post 12 preferably is formed with four slots 14 and a central hollow shaft 16. Preferably, the cluster posts are made from extruded aluminium cut to 600mm lengths. However, the cluster posts can 10 also be produced in longer lengths and may be used in some structures as a long support column. Each slot is defined by a pair of side walls 18, there being eight side walls 18 altogether defining the four slots 14. A first pair of the slots 14 face in opposite directions to each other and define a first joining plane, and a second pair of the slots 14 face in opposite directions to each other and define a second joining plane. In the illustrated 15 embodiment, the first and second joining planes are arranged at right angles to each other, however this is not necessarily an essential feature of the invention. Each of the slots 14 is sized to receive an end of one of the truss units 10 therein and a series of eight lock pin holes 20 are grouped at each end through the side walls 18 in two rows 50 millimetres apart.

20

In the preferred embodiment, the truss units are 500 millimetres deep measured between the centres of the top and bottom chords. The groups of holes 20 are also 500 millimetres apart to suit the truss units. A truss unit 10 can be fastened in either the top or bottom 25 groups of holes on the cluster post 12, allowing transverse trusses to be offset vertically by 50 millimetres from longitudinal trusses. Alternatively, the truss units can all be set in both longitudinal and transverse directions at the same level. If this is the top level of lock pin holes 20, then the lower holes can be used to carry ties and bracing for an under truss arrangement as illustrated in Figure 3(c). The truss units 10 are locked to the cluster post 12 by means of two lock pins 22. Conventional tubing from tube and coupler scaffolding 30 can be aligned in the central shaft 16 of the cluster posts 12, and various standard and customised fittings also fit into both the slots 14 and central shaft 16.

One of the principal advantages of the FlexitruSS building system is that the cluster posts 35 allow the trusses to span in both longitudinal and transverse directions. This not only means that the system can be supported from a variety of anchor points in either direction,

but it also allows for a more uniform distribution of load. The transverse trusses transfer load horizontally in the transverse direction when a load is applied to the longitudinal trusses. Hence, the load is distributed more uniformly over the building structure, further improving the strength to weight ratio of the truss building system.

5

A typical application of the truss building system is illustrated in Figure 3. Two groups of three metre truss units 10 are joined end to end to form a 12 metre span shown in plan view in Figure 3(a). 10 cluster posts 12 are used to join the longitudinal truss units 10 end to end as can be seen more clearly in Figure 3(b). Five two metre transverse truss units 10 10 are also connected to the cluster posts 12 and join the two longitudinal spans together. Diagonal plan bracing 24 may be used to give horizontal rigidity to the structure. Decking has been omitted for clarity, but also helps to stiffen the top chord of the truss span. Deck sections 26 typically come in two metre lengths and one metre wide as shown in Figure 2(b).

15

Under trussing as shown in Figure 3(c) can significantly increase the load-bearing capacity of the span. Three lengths of under truss puncheon 28 and two lengths of under truss cross brace 30 are supported in the central shafts 16 of three of the cluster posts 12. Wire and turn buckle bracing 32 is employed to tension the under trussing to the bottom chord of the span. The FlexitruSS span together with the under trussing then effectively becomes a single large truss with the longitudinal unit trusses 10 forming the top chord and the cross braces 30 forming the bottom chord of the truss. As is well understood in conventional trussing, if the distance between the top and bottom chords is double, the loading in the chords is halved. Therefore this method of under trussing further increases the load bearing capacity of the span. Though not visible in Figure 3(c) both of the longitudinal truss spans are provided with under trussing, and both sets of under trussing are joined by rigid two-way cross bracing.

30

Figure 4 illustrates another application of the FlexitruSS building system, in this case used to form a simple building frame. Two three metre unit trusses 10 are joined end to end using a cluster post 12 to form the vertical support frames and angled roof spans. Each angled roof span is joined to the vertical support frame by means of an eve piece 34 illustrated more clearly in Figure 2(f). Each eve piece 34 allows the roof span to be supported at an angle of 15 degrees to the horizontal (the eve piece 34 is shown in Figure 2(f) with a tube purlin fixed on to the horn). Purlins and sheeting rails can be fixed to the

outer support frame and chords using conventional tube and coupler fittings. At the bottom end of the vertical truss units 10, a base plate 36 is fitted to the open end of each chord and held therein by a lock pin 22.

5 The angled roof spans are joined at the ridge by a cluster post 12, with the bottom chords fastened to the holes 20 provided at the lower end of the cluster post 12, and a ridge piece 38 fastened to the holes 20 provided at the upper end of the cluster post 12. As can be seen more clearly in Figure 2(e), the ridge piece 38 is formed at an angle of 15 degrees and is provided with a male and a female section at each end. The male section fits into the
10 open end of the top chord of the truss unit 10 of the roof span. Each building frame so formed is joined to an adjacent building frame using two metre truss units extending transversely from the cluster posts 12 in the roof spans. Horizontal or transverse truss units 10 can also be used to join the vertical support frames in each bay as shown in Figure
15 4. A simple building frame of this nature could be used for encapsulating a building construction project. Access scaffolds can be hung from the roof spans and/or fixed off inside leg frames and chords.

20 Figures 5 to 8 illustrate other possible applications of the preferred embodiment of the truss building system according to the invention.
25 Figure 5 illustrates the way in which the basic components of the building system can be joined to form a catch fan on a building construction site. A series of two metre truss units 10 and three metre truss units 10 are joined end to end with cluster posts 12. Additional cluster posts 12 provided at each end of this horizontal span. The two metre truss unit is locked in position between levels of the building using conventional tube and coupler scaffolding which can be conveniently connected to the central shaft of the cluster post 12 and the top chord of the truss unit 10. The three metre truss units are then cantilevered outwards from the edge of the building and are connected to angled three metre truss units
30 10 by means of eve pieces 34. Two metre truss units extend transversely between each section of the catch fan and deck sections 26 are fixed to the three metre spans for decking.

35 Figure 6 illustrates an application of the FlexitruSS building system to an under floor suspended scaffolding. During construction of the suspended scaffolding, each three metre or two metre section can be cantilevered prior to hanging offering very high labour savings in the construction phase. Subject to design specifications, some of the hangers

may be removed when subsequent sections are suspended, as the truss building system provides sufficient strength and rigidity across the cluster post nodes. Chains are typically used for hanging the trusses from beams under the floor. The height of the scaffolding can be profiled to follow the "ceiling line" by introducing custom designed angle pieces 42.

5 The FlexitruSS building system allows spans in both directions greater than one truss unit. Furthermore, because the materials used are made from aluminium in-situ, erection is fairly simple and quick in a wide range of situations. For example, two men can readily man handle a 12 metre section (four truss units and five posts).

10 Figure 7 illustrates the application of the truss building system as a support frame for hanging lighting and audio equipment in theatres and auditoriums. The support frame 40 can be easily constructed in any desired configuration using the appropriately sized truss units 10 and cluster posts 12. Here again, because the main components of the truss building system are preferably made from aluminium, the entire support frame 40 is relatively light weight and can be suspended from the ceiling of the theatre or auditorium using suspension wires.

15 Figure 8 illustrates an application of the truss building system to form a dome-shaped building 44. In this instance, three metre truss units 10 are joined end to end using custom designed angle pieces 46. Angle pieces 46 are similar in design to ridge piece 38 illustrated in Figure 2(e), and can be made to order at any desired angle. Each bay of the dome-shaped building is joined to an adjacent bay using transverse truss units then connected to the cluster posts 12, in a similar fashion to that of the structure illustrated in Figure 4.

20 Figures 9 and 10 illustrate a further application of the truss building system for constructing a stage area 50. Both the state platform 52 and the lighting frame 54 are constructed in a similar fashion to the simple span illustrated in Figure 3. However, in this case four of the cluster posts 12, provided at each of the four corners of the platform 52, are extended to form support columns 56 as can be seen most clearly in Figure 9. Support columns 56 are made using the same aluminium extrusion as the cluster posts 12 and integrate with the FlexitruSS building system in the same way as the shorter length cluster posts 12. Figure 10 is a plan view of the stage platform 52 with decking removed.

25 It will be apparent from the foregoing description that the preferred embodiment of the

truss building system has a number of significant advantages, including but not limited to the following:

- (a) the main components are light weight and easy to handle reducing labour costs;
- 5 (b) the use of cluster posts 12 for joining the truss units gives the system an inherent flexibility that lends itself to a wide range of possible building structures;
- (c) the ability to connect truss units in both longitudinal and transverse directions enables more uniform distribution of load and further increases the strength to weight ratio, particularly over large spans;
- 10 (d) minimum number of basic components of the building system make it easy to use, and modular construction facilitate rapid erection;
- (e) it is fully compatible and can be integrated with conventional tube and coupler scaffolding.

15 Numerous variations and modifications will suggest themselves to persons skilled in the scaffolding and building arts, in addition to those already described, without departing from the basic inventive concepts. For example, the truss units 10 may come in a much greater variety of shapes, sizes and configurations, and the cluster posts may be modified accordingly. All such variations and modifications are to be considered within the scope 20 of the present invention, the nature of which is to be determined from the foregoing description.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A truss building system, the system comprising:
 - 5 a plurality of elongate truss units;
 - 10 a cluster post formed with four slots, each of said slots being adapted to receive an end of one of said truss units therein, a first pair of said slots facing in opposite directions to each other and defining a first joining plane, and a second pair of said slots facing in opposite directions to each other and defining a second joining plane, said first and second joining planes being arranged at a predetermined angle to each other; and wherein fastening means are provided for fastening the end of a truss unit in each of said slots whereby, in use, two of said truss units can be joined end to end along the first of said joining planes and two more of said truss units can be joined end to end along the second of said joining planes.
 - 15
 2. A truss building system as defined in claim 1, wherein said first joining plane is substantially perpendicular to said second joining plane whereby, in use, said truss unit can be joined to the one cluster post in both longitudinal and transverse directions.
 - 20 3. A truss building system as defined in claim 2, wherein each slot is defined by a pair of side walls, there being eight side walls altogether defining the four slots.
 4. A truss building system as defined in claim 3, wherein said fastening means comprises a plurality of holes formed in each pair of said side walls adapted to align with corresponding holes formed in the ends of the truss units, and wherein a locking pin is provided adapted to pass through said holes when aligned and to lock the end of the truss unit in the slot.
 - 25 30 5. A truss building system as defined in claim 3, wherein said cluster post is formed with a central hollow shaft adapted to receive tubing from conventional tube and coupler scaffolding therein.
 - 35 6. A truss building system as defined in claim 4, wherein said truss units each comprise a top chord and a bottom chord and wherein a transverse hole is provided

adjacent both ends of the top and bottom chords respectively and adapted to receive said locking pin therethrough.

7. A truss building system as defined in any one of claims 1 to 6, wherein said
5 cluster posts are made from extruded aluminium.

8. A cluster post for a truss building system, the cluster post comprising:

10 a rigid member formed with four slots, each adapted to receive an end of a truss unit
therein, a first pair of said slots facing in substantially opposite directions to each other and
defining a first joining plane, and a second pair of said slots facing in substantially
opposite directions to each other and defining a second joining plane, said first and second
joining planes being arranged at a predetermined angle to each other; and

15 a fastening means for fastening the end of a truss unit in each of said slots whereby, in use,
two of said truss units can be joined end to end along one of said joining planes and two
more of said truss units can be joined end to end along the other of said joining planes.

20 9. A cluster post as defined in claim 8, wherein said first joining plane is
substantially perpendicular to said second joining plane whereby, in use, said truss unit
can be joined to the one cluster post in both longitudinal and transverse directions.

25 10. A cluster post as defined in claim 9, wherein each slot is defined by a pair
of side walls, there being eight side walls altogether defining the four slots.

30 11. A cluster post as defined in claim 10, wherein said fastening means
comprises a plurality of holes formed in each pair of said side walls adapted to align with
corresponding holes formed in the ends of the truss units, and wherein a locking pin is
provided adapted to pass through said holes when aligned and to lock the end of the truss
unit in the slot.

12. A cluster post as defined in any one of claims 8 to 11, wherein said cluster
post is made from extruded aluminium.

35 13. A truss building system substantially as herein described with reference to

and as illustrated in any one or more of the accompanying drawings.

Dated this 30th day of April 2001.

5 **SCAFFCO ASSET HOLDINGS PTY LTD**

By Its Patent Attorneys

GRIFFITH HACK

10 Fellows Institute of Patent and Trade Mark

Attorneys of Australia.

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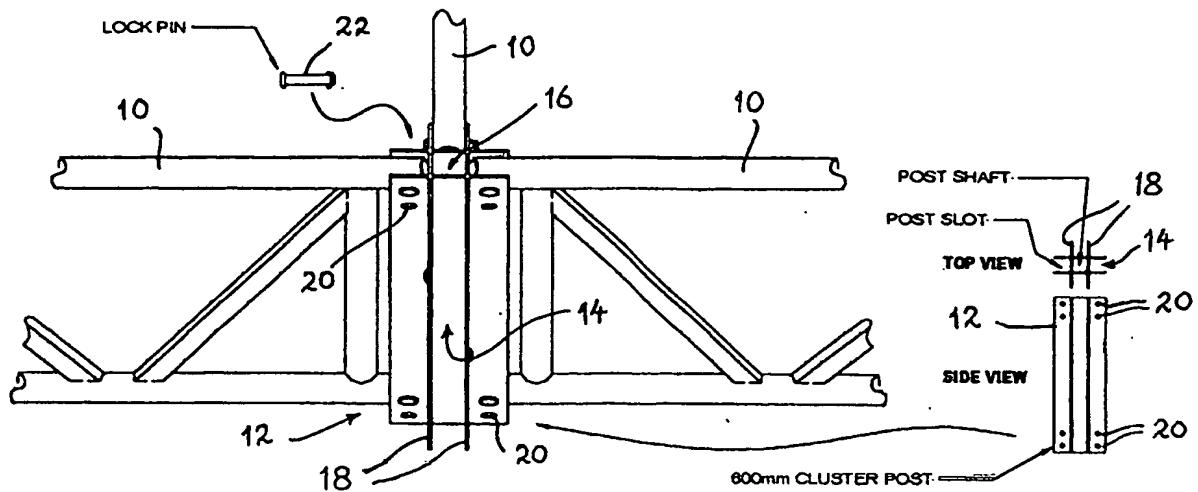


FIG. 1.

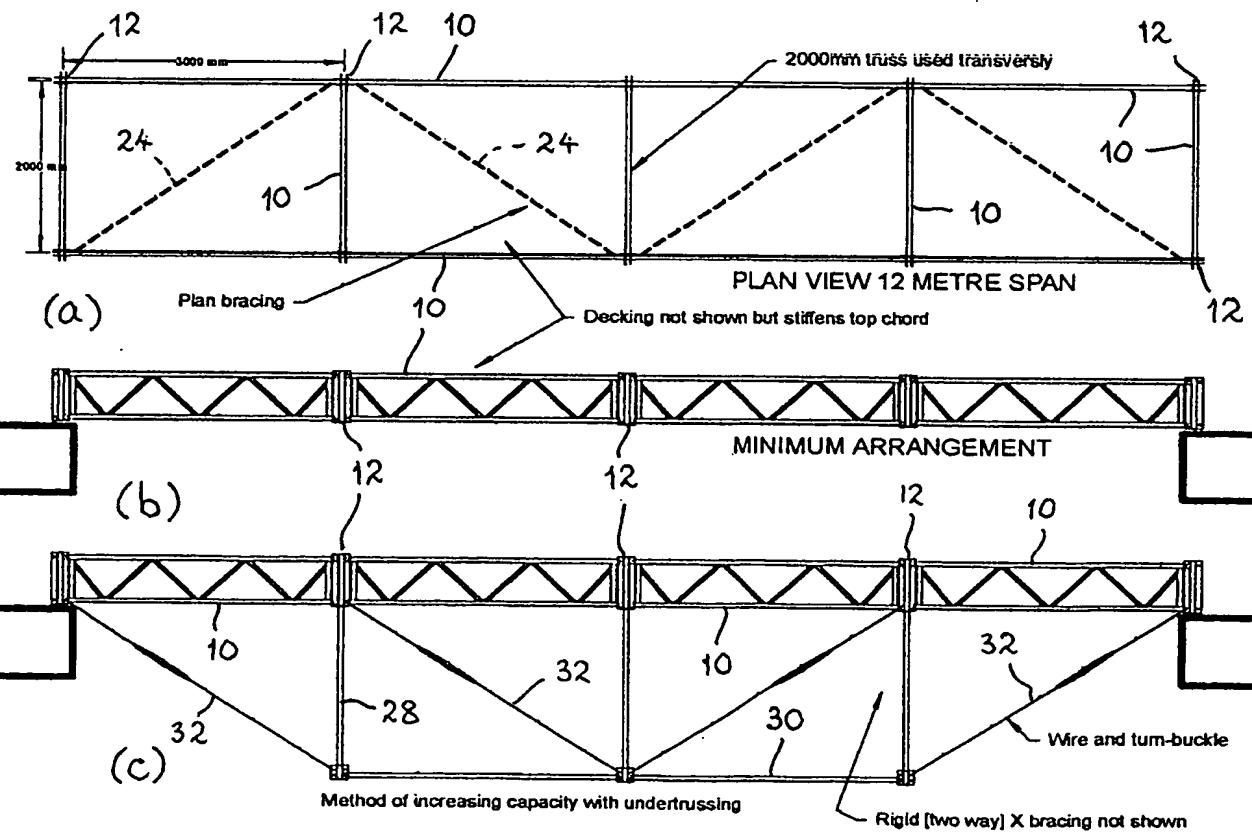


FIG. 3.

30 30 30 30 30

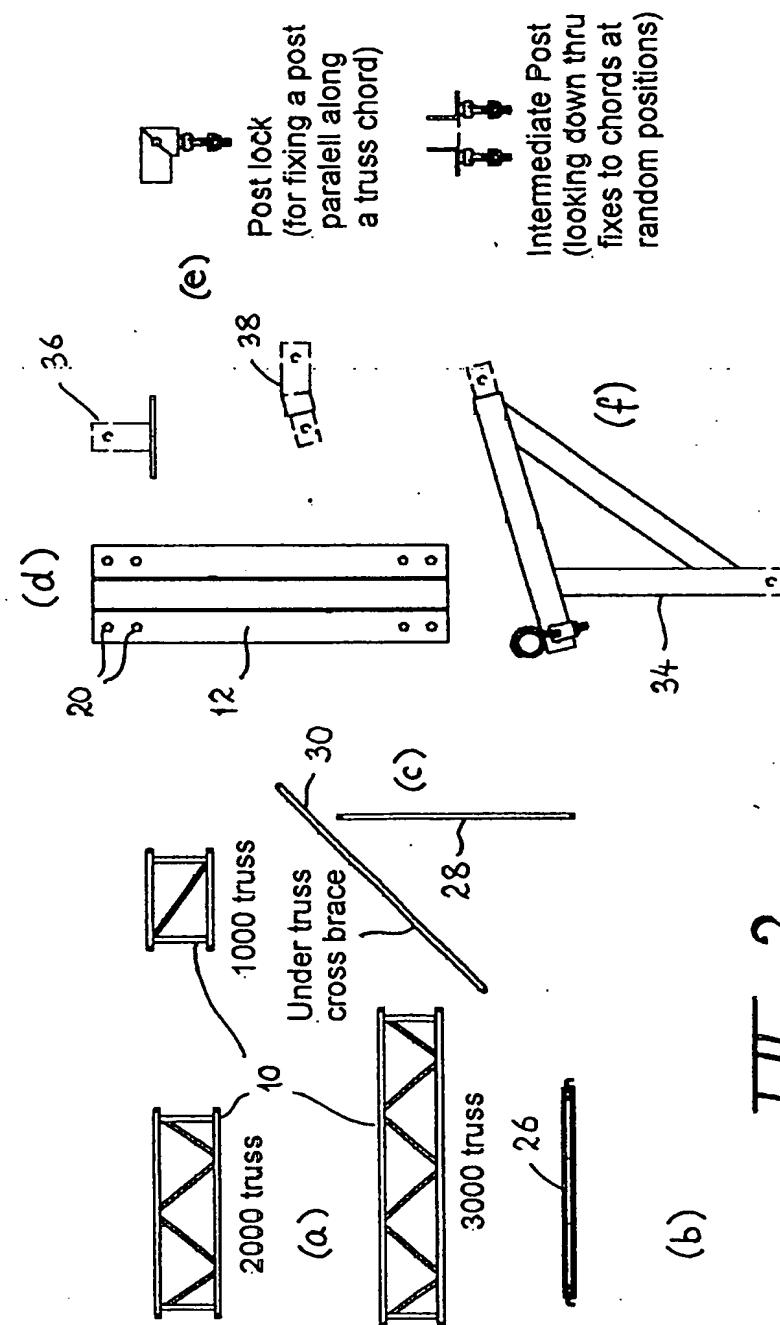
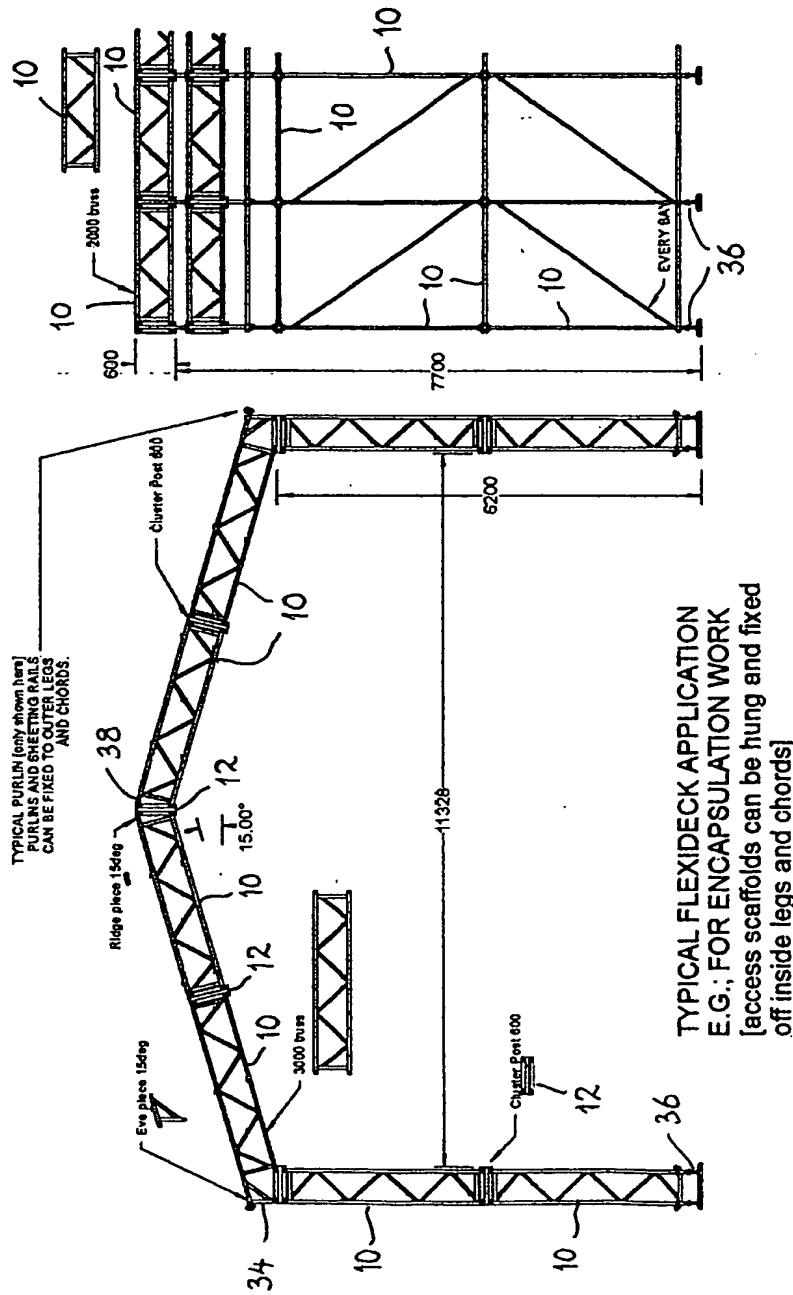


FIG. 2.



**TYPICAL FLEXIDECK APPLICATION
E.G.: FOR ENCAPSULATION WORK**
[access scaffolds can be hung and fixed
off inside legs and chords]

FILE 4.

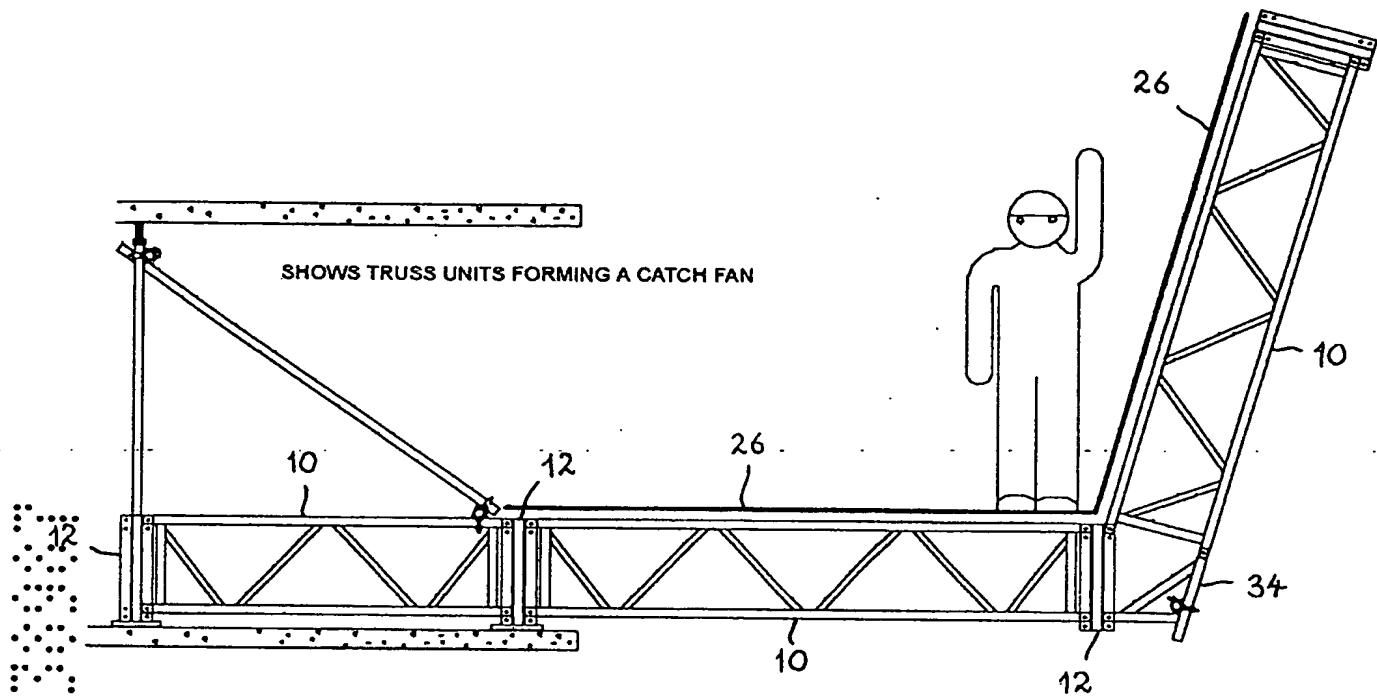


FIG. 5.

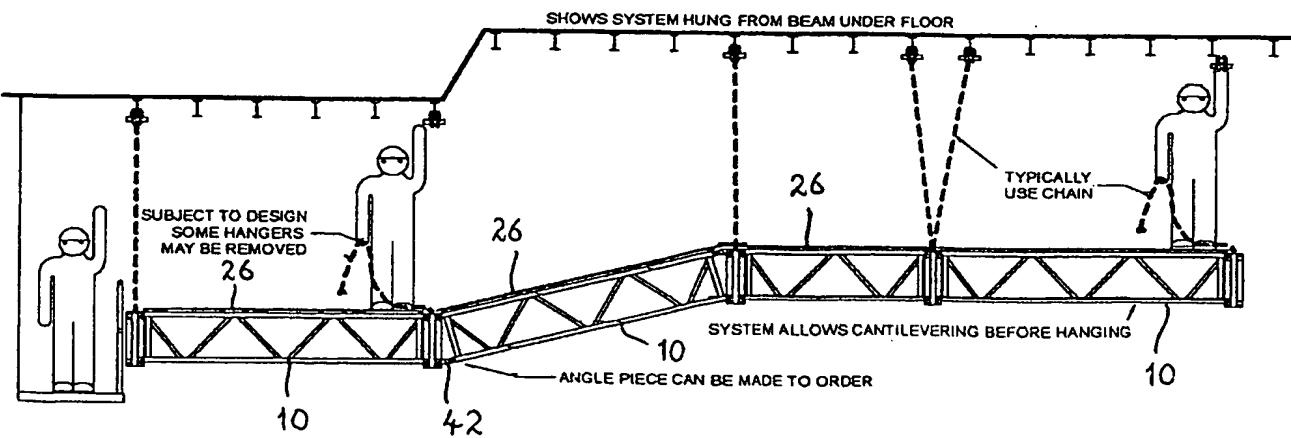


FIG. 6.

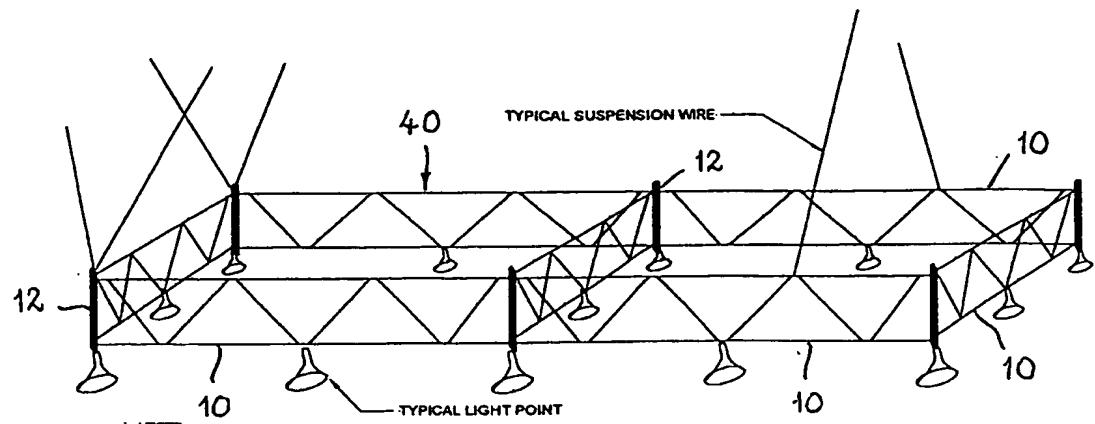


FIG. 7.

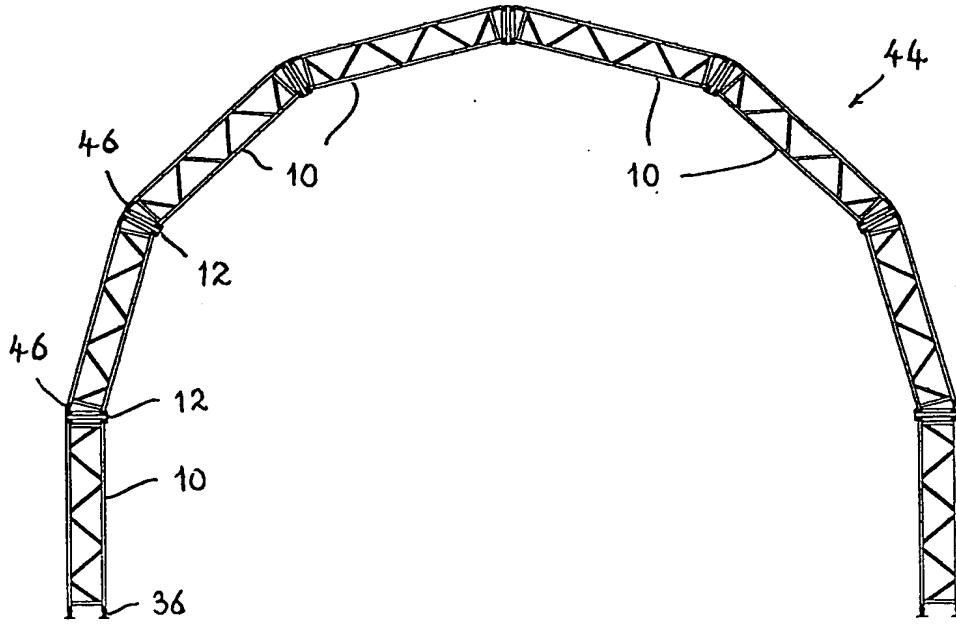


FIG. 8.

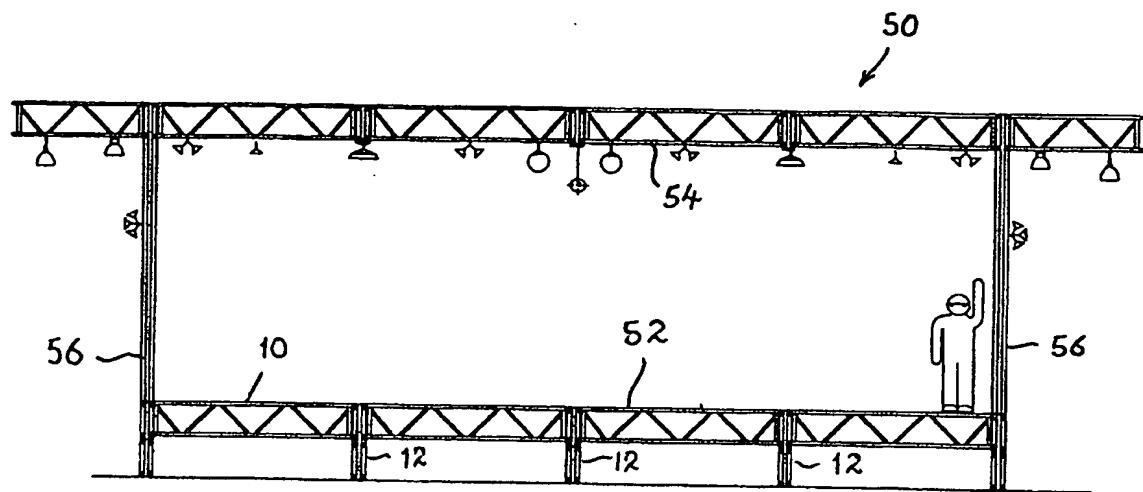


FIG. 9.

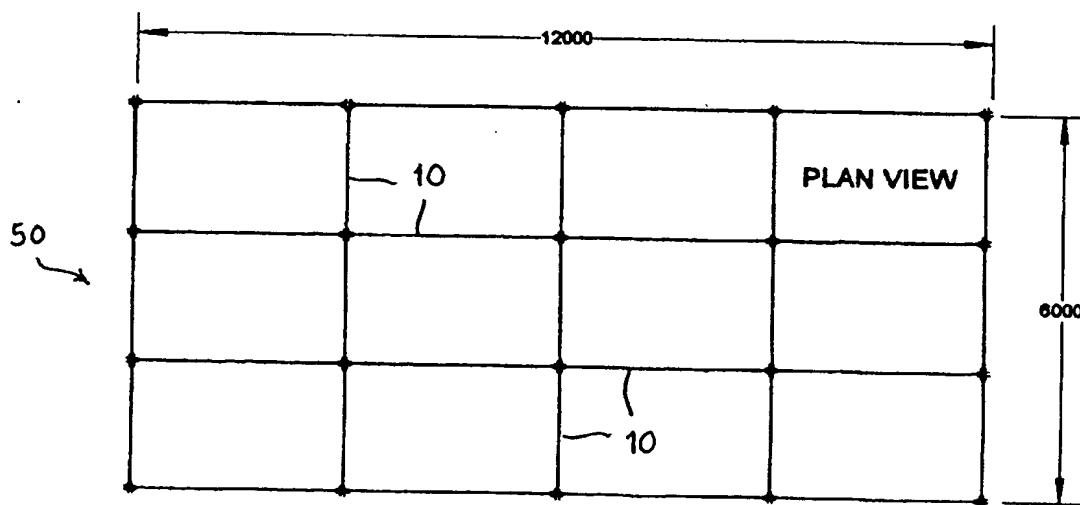


FIG. 10.